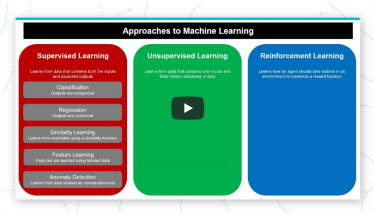
# Approaches to Machine Learning

There are three main approaches to machine learning:

- **Supervised learning**
- **Unsupervised learning**
- **Reinforcement learning**

We'll take a short, high-level look at these approaches here, and then revisit them in more detail in later lessons.




## Supervised learning

Learns from data that contains both the inputs and expected outputs (e.g., labeled data). Common types are:

- **Classification**: Outputs are categorical.
- **Regression**: Outputs are continuous and numerical.
- **Similarity learning**: Learns from examples using a similarity function that measures how similar two objects are.
- **Feature learning**: Learns to automatically discover the representations or features from raw data.
- **Anomaly detection**: A special form of classification, which learns from data labeled as normal/abnormal.

## Unsupervised learning

Learns from input data only; finds hidden structure in input data.

- **Clustering**: Assigns entities to clusters or groups.
- **Feature learning**: Features are learned from unlabeled data.
- **Anomaly detection:** Learns from unlabeled data, using the assumption that the majority of entities are normal.

## Reinforcement learning

Learns how an agent should take action in an environment in order to maximize a reward function.

- **Markov decision process**: A mathematical process to model decision-making in situations where outcomes are partly random and partly under the control of a decision-maker. Does not assume knowledge of an exact mathematical model.

The main difference between reinforcement learning and other machine learning approaches is that reinforcement learning is an *active process* where the actions of the agent influence the data observed in the future, hence influencing its own potential future states. In contrast, supervised and unsupervised learning approaches are *passive processes* where learning is performed without any actions that could influence the data.

QUESTION 1 OF 4

For each of the descriptions given below, mark which **general approach to machine learning** it best describes.

Supervised learning

| DESCRIPTION | APPROACH |
|---|---|
| Learns how an agent should take actions in an environment to maximize a reward function | Reinforcement learning |
| Learns from data that contains only the inputs | Unsupervised learning |
| Learns from data that contains both the inputs and expected outputs | Supervised learning |
| Finds hidden structures in data | Unsupervised learning |

SUBMIT

QUESTION 2 OF 4

Now let's get a bit more specific. All of the descriptions below refer to some type of supervised learning. Can you match them up?

*Submit to check your answer choices*

| DESCRIPTION | TYPE OF SUPERVISED LEARNING |
|---|---|
| Yields discrete categorical outputs | Classification |
| Learns from data labeled as normal/abnormal | Anomaly detection |
| Yields continuous numerical outputs | Regression |
| Characteristics of the data are learned using labeled data | Feature learning |
| Learns from examples using a similarity function | Similarity learning |

SUBMIT

QUESTION 3 OF 4

All of the descriptions below refer to some type of **unsupervised learning**. Can you match them up?

*Submit to check your answer choices*

| DESCRIPTION | TYPE OF UNSUPERVISED LEARNING |
|---|---|
| Assigns entities to clusters or groups | Clustering |
| Learns from unlabeled data assuming most entities are normal | Anomaly detection |
| Features are learned from unlabeled data | Feature learning |

SUBMIT

QUESTION 4 OF 4

Harry is an IT admin responsible for managing a legacy Web application. He has access to server performance logs with real-time system performance metrics (CPU, memory utilization, number of user sessions, number of threads, etc.). His task is to use ML to generate automated real-time alerts for preemptively detecting potential service outages.

What type of ML algorithm should Harry use?

- ○ Supervised
- ✓ Unsupervised
- ○ Reinforcement

SUBMIT

NEXT